DREDGED MATERIAL RESEARCH PROGRAM

TECHNICAL REPORT D-77-23

HABITAT DEVELOPMENT FIELD INVESTIGATIONS WINDMILL POINT MARSH DEVELOPMENT SITE JAMES RIVER, VIRGINIA

APPENDIX A: ASSESSMENT OF VEGETATION ON EXISTING DREDGED MATERIAL ISLAND

by

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Gloucester Point, Virginia 23062

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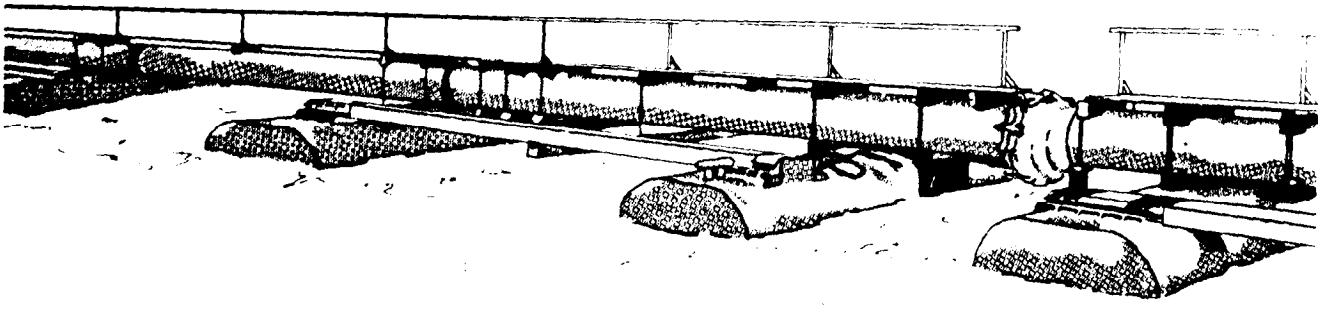

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HABITAT DEVELOPMENT FIELD INVESTIGATIONS, WINDMILL POINT
MARSH DEVELOPMENT SITE, JAMES RIVER, VIRGINIA

Appendix A: Assessment of Vegetation on Existing Dredged Material Island

Appendix B: Propagation of Vascular Plants

Appendix C: Environmental Impacts of Marsh Development with Dredged Material: Acute Impacts on the Macrobenthic Community

Appendix D: Environmental Impacts of Marsh Development with Dredged Material: Botany, Soils, Aquatic Biology, and Wildlife

Appendix E: Environmental Impacts of Marsh Development with Dredged Material: Metals and Chlorinated Hydrocarbons in Vascular Plants and Marsh Invertebrates

Appendix F: Environmental Impacts of Marsh Development with Dredged Material: Sediment and Water Quality

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A 1.57-acre dredged material island located near Windmill Point in the freshwater tidal reach of the James River, Virginia, was inventoried in 1974 to describe its plant community and wildlife use characteristics. The island was occupied by 58 plant species. Three distinct plant communities were present: a marsh community dominated by pickerel-weed (Pontederia cordata) associated with arrow arum (Peltandra virginica); a marsh/fastland pioneer community represented by wool grass (Scirpus cyperinus), tag alder (Alnus serrulata), and
(Continued)

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eight other species; and a fastland pioneer community dominated by dog-fennel (Eupatorium capillifolium) associated with species of aster.

Evidence of wildlife use was limited and consisted of muskrat-grazing sign on cattail and observations of herring gulls and terns occupying the island's spits and sand flats.

PREFACE

This report presents the results of an inventory of the plant community and wildlife use of a small (1.57-acre) dredged material island in the James River, Virginia. This study forms a part of the Dredged Material Research Program (DMRP), Environmental Effects Laboratory (EEL), U. S. Army Engineer Waterways Experiment Station (WES), Vicksburg, Mississippi. The investigation was conducted under Contract No. DACW65-75-M-1185 to the Virginia Institute of Marine Science, Gloucester Point, Virginia. Contracting was handled by the U. S. Army Engineer District, Norfolk (NAO): LTC R. H. Routh, CE, NAO, was Contracting Officer.

The report was written by Dr. G. M. Silberhorn and Mr. T. A. Barnard, Jr., Department of Wetlands Research, Virginia Institute of Marine Science.

The study was conducted under the direction of EEL personnel. The contract was managed by Mr. J. D. Lunz, Natural Resources Development Branch, under the supervision of Dr. T. Wood, Branch Chief, and Dr. C. J. Kirby, Chief, Environmental Resources Division. The study was under the general supervision of Dr. H. K. Smith, Habitat Development Project Manager, and Dr. J. Harrison, Chief, EEL. The Directors of WES during the conduct of the study were COL G. H. Hilt, CE, and COL J. L. Cannon, CE. The Technical Director was Mr. F. R. Brown.

CONTENTS

CONVERSION FACTORS, U. S. CUSTOMARY TO METRIC (SI)
UNITS OF MEASUREMENT

The U. S. customary units of measurement used in this report can be converted to metric (SI) units as follows:

Multiply	By	To Obtain
inches	2.54	centimetres
feet	0.3048	metres
acres	4046.856	square metres
cubic yards	0.7645549	cubic metres

HABITAT DEVELOPMENT FIELD INVESTIGATIONS, WINDMILL POINT MARSH DEVELOPMENT SITE, JAMES RIVER, VIRGINIA

APPENDIX A: ASSESSMENT OF VEGETATION ON EXISTING DREDGED MATERIAL ISLAND

PART I: INTRODUCTION

1. A small island (1.57 acres) near Windmill Point, James River, Virginia, has been created on a tidal flat as a result of intermittent dredged material deposition (uncontained) beginning in the 1890's, according to the U. S. Army Corps of Engineers, Norfolk District.* The most recent dredged material (over 92,000 cu yd) was deposited in this area in 1971. There are indications, however, that certain parts of the island were above mean high water prior to 1971. For example, the base of the southern spit of the island (see map, page A9) was vegetated in June and December 1974 by several cottonwood trees with trunks about 6 in. in diameter and heights up to 30 ft. These few trees may have started growth soon after a deposit was made in 1968 (89,400 cu yd). Cottonwood, Populus deltoides, in early stages of development can grow from 4 to 5 ft per year.

2. Using vegetation as an indicator, it is assumed that most of the island is of more recent exposure, perhaps as late as the 1971 deposits. The pioneer herbaceous plants that dominated much of the island were indicative of this type of situation.

3. A plant list for the entire island totals 58 species of seed-bearing plants. This is a relatively high diversity for such a small area and is comparable to that of tidal freshwater marshes, where there may be as many as 50 species of vascular plants per acre. However, this list includes both fastland and marsh species. (The list begins on page A1.)

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* A table of factors for converting U. S. customary units of measurement to metric (SI) units is presented on page 3.

PART II: PLANT COMMUNITIES AND HABITATS

4. There are three distinct plant communities on the island. Several different species of plants are characteristic of areas not designated here as distinct plant communities. A list of plants that are found in these communities and habitats appears on page B1.

Marsh Community

5. A small marsh community (approximately 0.3 acre) existed between the two spits on the downriver side of the island. The intertidal zone was dominated by pickerel-weed (Pontederia cordata) associated with arrow arum (Peltandra virginica). The upper part of the marsh, above mean high water, was dominated by marsh hibiscus (Hibiscus moscheutos). The marsh appeared to be in the initial stages of succession in that the individual plants were widely scattered and did not have the luxuriant growth of other marshes in the immediate area.

Marsh/Fastland Pioneer Community Ecotone

6. The species growing here represent a very narrow transition area between marsh and fastland. Typical of these species are wool grass (Scirpus cyperinus), tag alder (Alnus serrulata), ironweed (Vernonia noveboracensis), and marsh dogwood (Cornus amomum).

Fastland Pioneer Community

7. The dominant species in this area (about 0.75 acre) was dog-fennel (Eupatorium capillifolium) with associated species of aster. These species were apparently recent invaders since the last dredged material deposit in 1971. Most of the plants growing in this habitat were "weedy" species, typically flourishing in disturbed areas.

8. Alder shrubs grew in small shallow depressions within the area along with other plants typical of mesic situations.

Eroding Shoreline Habitat

9. Only scattered saplings of black willow (Salix nigra) and one sapling of bald cypress (Taxodium distichum) were found along the upriver shoreline. The dynamic conditions of this part of the island are exemplified by the fact that the small bald cypress tree had most of its lateral roots and tap root exposed and had fallen. It also seemed apparent that the two spits on the downriver side had resulted from sand transported from the eroding upriver shoreline.

Accreted Sand Area Habitat

10. The most common plants in this environment were horse nettle (Solanum carolinense), cocklebur (Xanthium strumarium), and wild sensitive plant (Cassia nictitans). This probably represents the most xeric part of the island with high soil temperatures during the summer months, similar to dune communities.

PART III: WILDLIFE

11. There was little evidence of mammals inhabiting the island. A small stand of cattails showed evidence of muskrat grazing. There was no evidence of dens, lodges, burrows, or excrement of any kind.

12. The only birds observed during site visits were herring gulls and terns occupying the spits and sand flats.

PART IV: CONCLUSIONS

13. Natural marsh succession is possible on dredged material sites provided that the shoreline is protected to some degree from erosion. In this case the main body of the island and the two spits were shelters for the small marsh.

14. Exposed dredged material does provide ample nutrients and moisture for certain pioneer invaders.

15. Although very large amounts of dredged material were deposited in recent history (1968-86,400 cu yd; 1970-62,700 cu yd; 1971-92,000 cu yd), only a small island (1.57 acres) remained after all these periodic depositions. However, it should be pointed out that it is not known whether deposits were made in the same locations each time. Nevertheless, it seems that uncontained dredged material cannot be relied upon for stable marsh development at this location in the James River.

APPENDIX A': A LIST OF VASCULAR PLANT SPECIES GROWING ON AN ARTIFICIALLY DEVELOPED ISLAND, WINDMILL POINT, JAMES RIVER, VIRGINIA

Key to abbreviations

LTU - Specimen deposited at Louisiana Tech University Herbarium.

VIMS - Specimen at Virginia Institute of Marine Science.

vims - Observed but no specimen collected.

Note: The only specimens collected by VIMS personnel were taken in December 1974. These specimens are not of herbarium quality; however, they are available upon request.

TAXODIACEAE Bald Cypress Family

(1) Taxodium distichum (L.) Richard — Bald Cypress
Habitat: Upper intertidal zone, eroding upriver shoreline. Roots exposed. Scarce, one sapling.
LTU, VIMS

TYPHACEAE Cat-tail Family

(2) Typha latifolia L. — Common Cat-tail
Habitat: Upper margins of marsh with Hibiscus moscheutos, sandy substrate. Frequent, one or two stands.
LTU, vims

(3) Typha angustifolia L. — Narrow-leaved Cat-tail
Habitat: Upper margins of marsh, with smartweed (Polygonum). Frequent.
vims

(4) Sagittaria falcata Pursh. sensu C. (Sagittaria lancifolia L.)
Habitat: Intertidal zone, with Pickerel Weed. Scarce, one or two clumps.
LTU, vims

GRAMINEAE Grass Family

(5) Echinochloa crusgalli L. Beauvois — Barnyard Grass

Habitat: Margin of marsh.
LTU

(6) Panicum virgatum L.

Switch Grass (Panic Grass)
Habitat: Old dredged material, with dog-fennel and asters. Common throughout the higher parts of the island.
LTU, VIMS

CYPERACEAE Sedge Family

(7) Cyperus esculentus L.

Yellow Nut Grass
Habitat: An indicator of disturbed areas, low sandy areas near the toe of the spits. Scarce.
LTU, vims

(8) Cyperus strigosus L.

Habitat: Upper margin of marsh, also an indicator of disturbed areas.
LTU

(9) Scirpus americanus Persoon.

American Three-square
Habitat: Intertidal marsh. Frequent.
LTU, vims

(10) Scirpus validus Vahl.

Softstem Bulrush (Great Bulrush)
Habitat: Intertidal marsh, with pickerel weed.
LTU, vims

(11) Scirpus cyperinus (L.) Kunth

Wool Grass
Habitat: Marsh/Eastland ecotone. Frequent.
LTU, vims

(12) Carex spp.

Habitat: Upper reaches of the marsh. Note: At least two species of Carex were observed on June 5, 1974. However, the plants were immature and a positive identification was not possible. One of the species was probably C. stricta Lam. Frequent.
vims

ARACEAE Arum Family

(13) Peltandra virginica (L.) Kunth. Arrow Arum
Habitat: Intertidal marsh, growing with pickerel-weed, Pontederia cordata L. Frequent.
LTU, vims

COMMELINACEAE Spiderwort Family

(14) Aneilema Keisak Hasskarl.
Habitat: Upper limits of the marsh with smartweeds and tearthumb. Frequent.
vims

PONTEDERIACEAE Pickerel-weed Family

(15) Pontederia cordata L. Pickerel-weed
Habitat: Intertidal marsh, associated with arrow arum, pickerel weed in larger numbers. Common.
LTU, vims

JUNCACEAE Rush Family

(16) Juncus spp.
Habitat: Marshes. Scarce.
LTU, vims

SALICACEAE Willow Family

(17) Salix nigra Marshall Black Willow
Habitat: Margin of marsh and spit. Common.
vims

(18) Populus deltoides Marshall Cottonwood
Habitat: Sandy spit. Scarce, 6 small trees, up to 30' high.
vims

BETULACEAE Birch Family

(19) Alnus serrulata (Aiton) Willd. Tag Alder
Habitat: Low depressions in upper part of island.

Frequent.
LTU, VIMS

ULMACEAE Elm Family

(20) Celtis occidentalis L. — Hackberry
Habitat: Higher part of island, sandy. One sapling.
LTU, vims

URTICACEAE Nettle Family

(21) Boehmeria cylindrica (L.) Swartz — False Nettle
Habitat: Upper part of marsh, in rich sediment. Scarce.
LTU, vims

(22) Rumex verticillatus L. — Swamp Dock
Habitat: Upper limits of marsh. Scarce.
vims

POLYGONACEAE Buckwheat Family

(23) Rumex crispus L. — Curly Dock
Habitat: An indicator of a disturbed area, higher part of the island, with bitter dock. Scarce.
vims

(24) Rumex obtusifolius L. — Bitter Dock
Habitat: Sandy dredged material area, typical "weedy" plant. Frequent.
VIMS

(25) Polygonum lapathifolium — Nodding Smartweed
Habitat: Alluvial soils, disturbed habitat. Upper part of marsh. Frequent.
LTU, VIMS

(26) Polygonum punctatum Ell. — Dotted Smartweed
Habitat: Upper part of marsh, rich sediments. Frequent.
LTU, VIMS

(27) Polygonum sagittatum L. — Sagittate Tearthumb
Habitat: Upper parts of marsh with dotted smartweed.

Frequent.
VIMS

CHENOPODIACEAE Goosefoot Family

(28) Chenopodium ambrosioides L.
Mexican Tea
Habitat: Common weed in disturbed areas. Frequent.
vims

(29) Amaranthus cannabinus (L.) J. D. Daur
Water-hemp
Habitat: Marsh, with cattails. Scarce, several plants.
vims

RANUNCULACEAE Buttercup Family

(30) Clematis virginiana L.
Virgins Bower
Habitat: Depression in old dredged material. Scarce.
vims

CRUCIFERAE Mustard Family

(31) Rorippa islandica (Oeder) Borbas
Bog Marsh-Cress
Habitat: Along the upper part of marsh.
LTU

FABACEAE Pea Family

(32) Cassia nictitans L.
Wild Sensitive Plant
Habitat: Disturbed areas, with horse nettle. Frequent.
LTU, vims

(33) Lespedeza cuneata (Dumont) G. Don.
Sericea
Habitat: Characteristic of disturbed areas, with dog-fennel. Common.
LTU, VIMS

(34) Robinia pseudo-acacia L.
Black Locust
Habitat: Old dredged material, upper parts of island. Scarce, several saplings.
LTU, VIMS

(35) Apios americana Medicus. Ground-Nut
Habitat: Sandy areas.
LTU

BALSAMINACEAE Balsam Family

(36) Impatiens capensis Meerb. Jewel-weed
Habitat: Upper part of marsh.
Scarce.
vims

MALVACEAE Mallow Fammily

(37) Hibiscus moscheutos L. Marsh Hibiscus
Habitat: Upper part of marsh, with cat-tails. Frequent.
LTU, VIMS

(38) Ludiwigia decurrens Walter Primrose-willow
Habitat: Marsh.
LTU

(39) Ludiwigia uruguayensis (camb.) Hara. Water-Primrose
Habitat: Marsh.
LTU

(40) Ludiwigia palustris (L.) Ell. Marsh Fleabane
Habitat: Marsh.
LTU

CORNACEAE

(41) Cornus amomum Miller Marsh Dogwood
Habitat: Upper part of marsh.
Scarce.
vims

OLEACEAE Olive Family

(42) Fraxinus americana L. White Ash
Habitat: Upper part of island. Scarce.
LTU, VIMS

ASCLEPIADACEAE Milkweed Family

(43) Cynanchum laeve (Michaux) Persoon. Sand-vine
(Ampelamus albidus) (Nutt.) Britt.

Britt.

Habitat: Sandy areas.
LTU

SOLANACEAE Nightshade Family

(44) Solanum carolinense L. — Horse Nettle
Habitat: Disturbed, sandy areas. Frequent.
VIMS

SCROPHULARIACEAE Figwort Family

(45) Agalinis purpurea (L.) Pennell. — Gerardia
Habitat: Upper part of island.
LTU

LENTIBULARIACEAE Bladderwort Family

(46) Justicia americana (L.) Vahl — Water-willow
Habitat: Intertidal marsh.
Scarce.
vims

RUBIACEAE Madder Family

(47) Cephalanthus occidentalis L. — Button Bush
Habitat: Margin of marsh.
Scarce.
vims

COMPOSITATE Composite Family

(48) Xanthium strumarium L. — Cocklebur
Habitat: Disturbed, sandy area. Frequent.
LTU, vims

(49) Vernonia noveboracensis (L.) Michx. — Ironweed
Habitat: Near upper margin of marsh.
LTU, vims

(50) Eupatorium capillifolium (Lam.) — Small Dog-fennel
Habitat: Old dredged material. The most common plant on the

island.
LTU, VIMS

(51) Mikania scandens (L.) Willd.
Climbing Hempweed
Habitat: Upper part of marsh.
LTU

(52) Aster subulatus Michaux.
Annual Saltmarsh Aster
Habitat: Marsh.
LTU

(53) Aster puniceus L.
Habitat: Margin of marsh.
Frequent.
VIMS

(54) Aster vimineus Lam.
Habitat: Depressions in upper part of island. Frequent.
VIMS

(55) Aster dumisus L.
Habitat: Growing with dog-fennel. Frequent.
VIMS

(56) Solidago altissima L.
Goldenrod
Habitat: Disturbed sites, with dog-fennel.
LTU, VIMS

(57) Bidens frondosa L.
Beggar-ticks
Habitat: Marsh.
LTU, vims

(58) Helenium autumnale L.
Sneeze-weed
Habitat: Near upper margin of marsh, with button bush.
Frequent.
VIMS

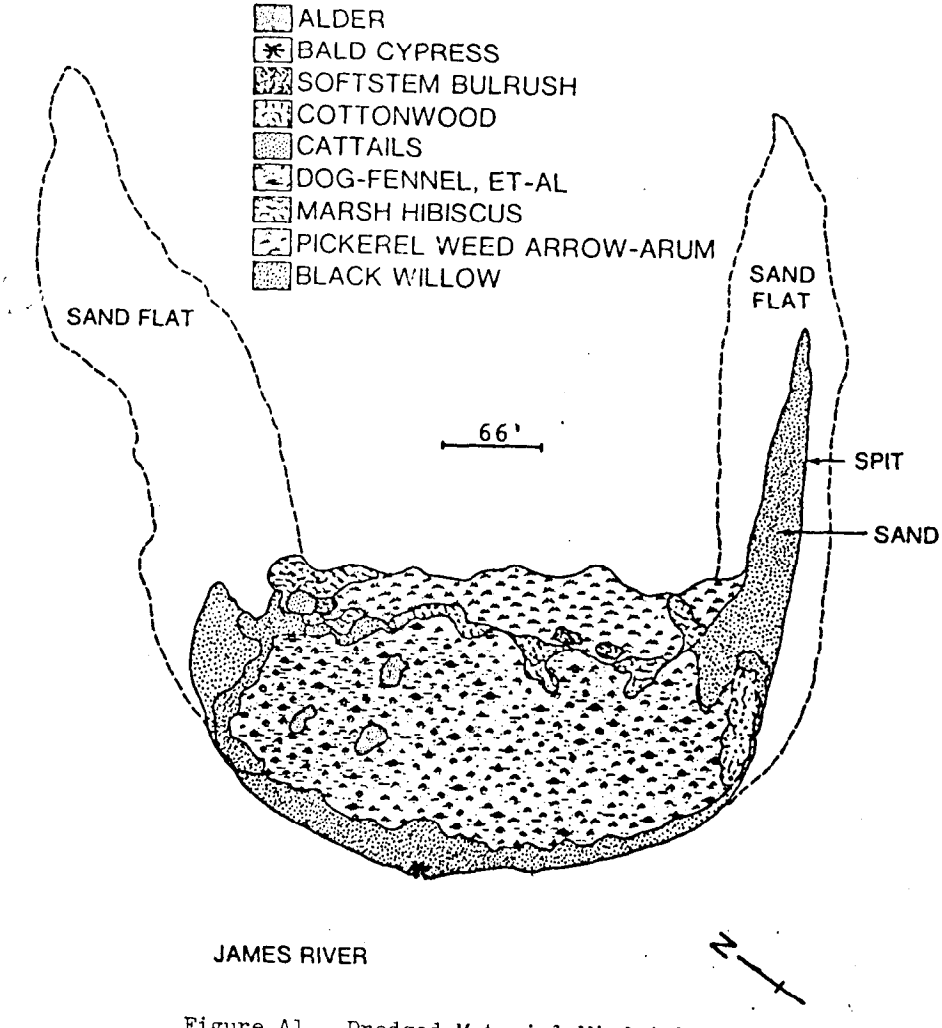

Figure A1. Dredged Material-Windmill Point, James River, Virginia

APPENDIX B': A LIST OF COMMUNITIES AND HABITATS AND ASSOCIATED VEGETATION

I. Marsh Community

A. Intertidal (MLW to MHW)

Arrowhead Sagittaria falcata
American Three-square Scirpus americanus
Great Bulrush Scirpus validus
Arrow Arum Peltandra virginica
Pickerel-weed Pontederia cordata
Rushes Juncus spp.
Primrose-Willow Ludiwigia decurrens
Water-Primrose Ludiwigia uruguayensis
Marsh Fleabane Ludiwigia palustris
Water-willow Justicia americana
Annual Saltmarsh Aster Aster subulatus

B. Upper Limits

Common Cattail Typha latifolia
Narrow-leaved Cattail Typha angustifolia
Carex spp.
Aneilema keisak
False Nettle Boehmeria cylindrica
Swamp Dock Rumex verticillatus
Dotted Smartweed Polygonum punctatum
Sagittate Tearthumb Polygonum sagittatum
Water-hemp Amaranthus cannabinus
Bog Marsh-Cress Rorippa islandica
Jewel-weed Impatiens capensis
Marsh Hibiscus Hibiscus moscheutos
Button Bush Cephalanthus occidentalis

II. Marsh/Fastland Pioneer Community Ecotone

Barnyard Grass Echinochloa crusgalli
Cyperus strigosus
Wool Grass Scirpus cyperinus
Tag Alder Alnus serrulata
Wild Sensitive Plant Cassia nictitans
Marsh Dogwood Cornus amomum
Gerardia Agalinis purpurea
Ironweed Vernonia noveboracensis
Climbing Hempweed Mikania scandens
Aster puniceus

III. Fastland Pioneer Community

A. Dry (Xeric) Areas (Dredged material)

Switch grass Panicum virgatum
Hackberry Celtis occidentalis

Curley Dock Rumex crispus
Bitter Dock Rumex obtusifolius
Mexican tea Chenopodium ambrosioides
Sericea Lespedeza cuneata
Black locust Robinia pseudo-acacia
Dog-fennel Eupatorium capillifolium
Aster dumisus

B. Wet (Mesic) Depressions (Dredged material)
Switch grass Parieum virgatum
Yellow Nut-grass Cyperus esculentus
Tag Alder Alnus serrulata
Bitter Dock Rumex obtusifolius
Nodding Smartweed Polygonum lapathifolium
Virgins Bower Clematis virginiana
Bog Marsh-Cress Rorippa islandica
White Ash Fraxinus americana
Aster vimineus

IV. Eroding Shoreline

Bald Cypress Taxodium distichum
Black Willow Salix nigra

V. Accreted Sand Areas (Toe of Spit)

Yellow Nut-grass Cyperus esculentus
Black Willow Salix nigra
Cottonwood Populus deltoides
Wild Sensitive Plant Cassia nictitans
Ground Nut Apios americana
Sand-vine Cynanchum laeve
Horse Nettle Solanum carolinense
Cocklebur Xanthium strumarium

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